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Fuel wood and Charcoal Harvesting as a means of Poverty Alleviation among Gwagwalada Residence.

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Abstract
This study assessed the Socio-economic effects of Fuel wood and Charcoal consumption in some selected settlements in Gwagwalada Area Council, with the view of identifying how fuel wood consumption has positively improve the social and economic life of the people and it consequences on the health and the environment at large. The study employed survey research design. A sample of 341 respondents was selected for the study which comprises of the sellers of the fuel wood and the general public who make use of the products. The respondents were selected randomly from the eight communities and analysed using the SPSS for percentage, mean, standard deviation and coefficient of variation. Results show that the main sources of cooking energy in Gwagwalada Area Council is fuel wood and charcoal which served 23.2% of the respondents, as their major source; and 73.6% claimed that they acquire the fuel wood and charcoal through purchase from the marketers with a response mean score of mean=2.78, standard deviation of 1.15 and coefficient of variation of 41.67%, implying that the their responses are having diverse views, this cuts across all the socio-economic groups, however, their awareness on the environmental impacts was very low. It also shows that 37% earned less than N18, 000, followed by 20.8% earning N51, 000 and above, others earned average of N20, 000. Though accessing fuel wood and charcoal is becoming a little bit difficult, it still remains the cheapest as fuel wood/charcoal worth of N50 can serve for a household meal. All of the respondents, with mean score of 1.65, SD=0.5 and COV=30.2 indicated of haven experienced one form of health problem the other. They benefited in terms of employment and wealth creation. Some recommendations were made among which are; alternative energy sources should be encourage, tree farming culture, improve ways of harnessing and using fuel wood should be encourage.

Key words: Fuel wood, charcoal, harvesting, health problems,

Introduction

Forest is an important natural resource that covers approximately one third of the earth's surface, equivalent to 4 billion hectares. They comprise a wide variety of ecosystem that range from open savannah woodlands to dense tropical rain forest and they are some of the most biological diverse system on the planet (Food and Agricultural Organization, FAO, 2005). These forest ecosystem does not only provide a range of environmental services that include soil, watershed conservation and carbon sequestration, but also extensive economic benefits from timber, energy, industrial development, Medicine and recreation among others. The present day forest cover is approximately half of what existed in pre-agricultural times, the majority of which has been lost in the last three decade (FAO, 2010).

One of the most useful forest resources consumed by man is fuel wood. Fuel wood comprises of wood and wood pulp material obtained from trunks, branches and other parts of trees and shrubs used as fuel for cooking, heating or generating energy through direct combustion. It was noted that among all tree products, fuel wood is the mostly utilized in Nigeria (Ezema, 2001 in Ebe, 2006). The rural population traditionally relies on the forest for various food products and fuel wood (NTFPs), both for own consumption and for sales to the urban sector. Chukwu (2000) observed that over 70% of the total population of Nigeria relies on fuel wood or charcoal as their major source of energy for cooking and heating purposes. The Solar Cooking Archive (2011) put the estimate of Nigeria's fuel wood consumption at about 87%. The household sector accounted for 15 to 25% of primary energy use in developed countries. It has been noted that fuel wood trading is a very profitable

business (Ebe, 2006). Ebe also indicated that in Enugu State of Nigeria, fuel wood supply were influenced largely by socio-economic and production factors such as farmer's age, education, household size, transportation cost, price of fuel wood, labour time, income, price of alternative sources of energy. He maintained that the increase in consumption of fuel wood in Nigeria could be attributed to the following two major factors:

1. Rapid urbanization brought about by migrants from rural areas that carried along with their rural ways of life;
2. Scarcity of conventional fuels such as kerosene, cooking gas and the subsequent increase in the prices of these fuels.

With increasing demand for fuel wood in urban areas and rural areas of Nigeria (Remedio, 2004) a market system was being developed for the product thus creating new business opportunities that is capable of reducing poverty among the rural farmers who have access to the Savannah and forest vegetation of Nigeria where fuel wood are mostly found. The problem of cooking fuel scarcity was exacerbated by increasing energy crisis in the world which makes conventional fuel derived from crude oil less affordable. Whereas the fossil-fuel crisis affected mainly urban households in developed countries, the firewood crisis was said to be affecting rural households in developing countries. It manifested itself as a severe shortage of firewood, the main cooking and heating fuel used by such households (Arnold et al., 2003).

According to the World Counts, (2014), 13 million hectares of forest have been converted for other uses or destroyed by natural causes. Up to 28,000 species can go extinct in the next quarter century due to deforestation. By the year 2030, we might only have 10% of Rainforests left and it can all disappear in a hundred years.10% of the world's forests are now protected areas. This is roughly the size of India. Tropical Rainforests store more than 210 gigatons of carbon and deforestation is the cause of 15% of carbon emissions. Cures for diseases have been found in plants and the raw materials come from our tropical rainforests.

This decline has been attributed to various factors that include changing livelihood patterns, such as the transition from hunter-gathering to sedentary agriculture (Sunderlin, et al, 2005) and socio-economic demands of development for timber, wood fuels, fibres and urban expansion (Middleton, 2003). While deforestation slowed down between the year 2000 and 2005, nonetheless the process is progressing at an alarming rate, with forest loss estimated at 7.3 million hectares per year, predominantly in Africa and South America (FAO, 2005). The world's largest consumption of charcoal is on the African continent with attendant air emissions its related environmental problem (Kituyi, 2004). The extraction of timber for wood fuel account for 61% of total wood removals (FAO, 2010), this highlights the importance of these fuels in the energy mix of many countries.

The charcoal production has been known since the Bronze Age and was vital to metallurgical industries until the discovery of the Conversion of Coal to Coke at the beginning of the 18th Century when there was increasing scarcity of easily harvested wood (FAO, 2014). The world largest charcoal producer "Brazil" with more than 12 million metric tons in year 2002 has preserved its charcoal based industries in large part because it has extensive Iron deposit and very few coal mines (Rosllo-calle, et al, 1996) In most African countries, charcoal is the primary energy source for cooking and heating as well as major source of income generation and environmental degradation in rural areas (Kammen and Lew, 2005). In contrast to the developing countries in Africa and Asia, the European and North American countries use large amount of charcoal: for barbeque fuel, in foundries and forges for extraction and refining of Metals especially Iron, and in Numerous other metallurgical Industries ditto also in the Cement Factories and allied chemical companies. (FAO, 2015).

Global energy demand is projected to increase rapidly in coming years, with population growth and lifestyle changes in developing economies placing ever greater demand on current energy supply grids. This may be particularly true for Africa, where economic development can be directly linked to energy demand: a 1% growth in GDP is projected to require 0.55% increase in energy production (Kebede, et al, 2010). Moreover, Africa constitutes approximately 13% of the world population but consumed only 5.6% of the global energy

supply as at 2001, United Nations Department of Economic and Social Affairs (UNDESA), 2004). Therefore, it is expected that African per-capita energy use (ca. 41% of the global average) is likely to increase with growing trade, changing lifestyles and improving infrastructure.

Energy provision is a basic human need and consumption is closely related to the level of a country's development (United Nations-Energy, 2005). This is observed in the poor Human Development index (HDI: measure of development based on life expectancy, education and standard of living) scores and the low energy consumption of many developing countries like Nigeria heavily dependent upon wood fuels for their energy requirement (Arnold et al, 2006). The growing demand for charcoal has resulted in localized deforestation in vulnerable areas, particularly surrounding urban centres. A typical example is the influx of charcoal trucks into the Lagos metropolis from neighbouring state such as Ogun and Oyo State that still host most rural community. In these locations forest degradation and associated socio-economic and environmental impacts can be observed. These impacts are also observed in the relationship between Gwagwalada town and its surrounding rural communities.

Charcoal production is an important economic activity in rural Gwagwalada, and also important source of energy in the area council. With the increasing population and urban expansion in the study area, it is no doubt that energy demands have increased significantly in recent times, of course which leads to higher consumption of wood fuel. Several studies on charcoal (Karekezi and Majoro, 2002; Mugo and Poulstrup , 2003; Knöpfle, 2004; Bailis et al., 2005;Beukering, et al, 2007; Brew-Hammond and Kemausuor, 2009; Gumbo, et al, 2013; Iiyama et al., 2014) have also shown that the production of wood fuel follow downward spiral of livelihood, suggesting that deforestation is the result of unsustainable resource use driven by poverty. This study is therefore directed towards assessing the nature and trend of fuel wood consumption in Gwagwalada Area Council.

The role of poverty on wood fuel consumption

Information for this review was sourced from the publications of National Bureau of Statistics (NBS, 2007) and other sources. Table 1 is used to present findings and a correlation analysis was used to establish the relationship between poverty and the quantity of wood consumption by regions. The average percentage of wood used in 2007 in each of the six geopolitical regions of Nigeria was studied in relation to the poverty level of Nigerians in these respective regions (Table 1).

Table 1: Poverty rate and percentage of wood as fuel source by geopolitical regions.

Region	Poverty rate	Per cent
North-east	72.2	95.9
North-west	71.2	95.3
North-central	67.2	86.4
South-west	43.0	54.9
South-east	26.7	78.0
South-south	35.1	72.7

Source: NBS (2007).

Table 1 clearly show that the poverty rate strongly suggests the use of wood fuel as cooking fuel, except for south-eastern Nigeria, whose poverty rate is lower than that of southern Nigeria, but has a higher percentage of cooking fuel as wood fuel. On a general note, a correlation coefficient of 0.771 (significant at 5%) shows that the poorer region tends to use more wood fuel to meet their domestic requirements. This finding suggests that poverty is a key factor in wood fuel consumption. These poorer regions (such as Northern Nigeria) have less woody vegetation compared to the richer regions (such as Southern Nigeria). In fact, forests are almost non-

existent in the northern regions of the country, except for a few patches of trees here and there in the north-western and north-eastern parts of the country, and a better-off north central part, which forms the Savannah zone. These northern regions consume more wood fuel than the southern regions, where the forests are concentrated, on account of their higher poverty rate. A critical implication here is that more pressure is brought to bear on the patchy forests of the northern regions and, as time goes on, the movement of wood fuel in the form of commercially processed charcoal from the southern regions northwards will intensify, bringing much pressure on the largely overexploited forests of the country.

The Energy Ladder

Analysis of the wood fuel data over the decades has revealed certain trends in the wood fuel consumption. Firewood is the predominant fuel used in the rural areas of developing countries, whereas charcoal is the preferred fuel in urban centres replacing firewood as incomes rise (Arnold et al., 2006; Kituyi, 2002). This transition is often referred to as the "fuel ladder". Figure 1 describes the situation where firewood and charcoal, which occupy the lower rungs of the ladder, are then substituted by kerosene, gas and commercial electricity as you rise up through the rungs (Brouwer and Falcao, 2004). The implication of this is that as the economies of developing nations grow, one would expect to see a decline in the wood fuel mix of the country (Girard, 2002). This has indeed been observed in Asia where the consumption of wood fuels is declining in favour of alternative fuels, reflecting the rapid economic growth of the region since the 1980s. However, in Africa, one of the most marginalized regions in the world, economic growth has been slow and wood fuel consumption is increasing (Kituyi, 2002). This growth is associated with the rural to urban migration found in many African countries, combined with low incomes and savings, which inhibit the transition to others fuel types. As a result, Africa's wood fuel dependence is likely to persist for decades to come, which could have significant consequences for forest resources and the rural livelihoods dependent upon them (Kituyi, 2002; WEC, 2004).

Materials and Methods

Gwagwalada Area Council is one of local government area in the Federal Capital Territory (FCT) of Nigeria. It is located between latitudes 8º55' and 9º00' north of the equator and longitudes 7º00' and 7º05' east of the Greenwich Meridian. The area covers a total of 65 square kilometres (6,500 square metres). It is bisected horizontally into two parts by the Usuma River and vertically by the A2 road. A few kilometres away from the town lies some other urban centres, which include Kwali in the Southwest; Kuje in the Southeast and Zuba in the Northeast.

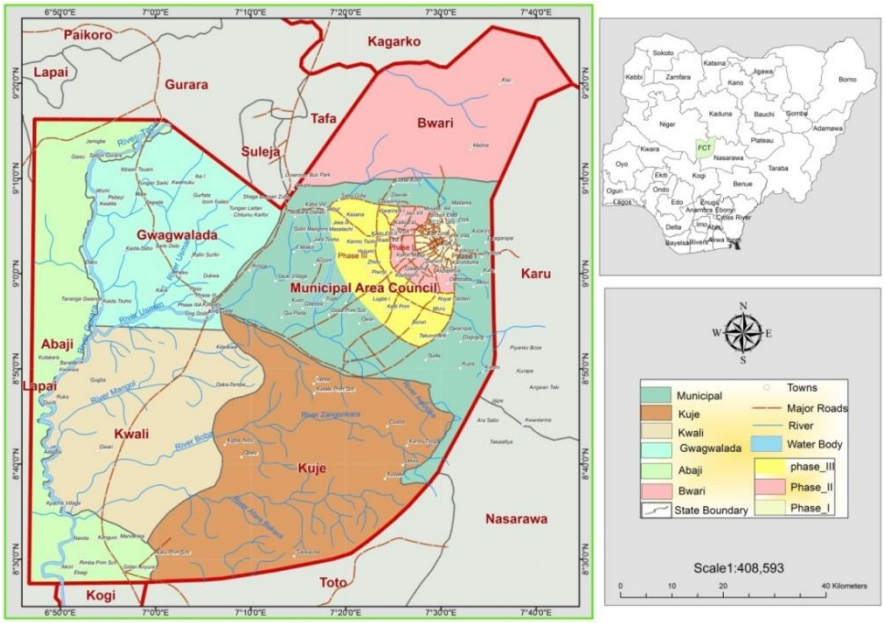

Figure 1: Federal Capital Territory Showing Area Councils
Source: Gwagwalada Area Council Information Department, 2009

Gwagwalada lies on a continuous undulating plain land of about 600m above sea level. The town receives on average annual rainfall of 1655.3mm. About 60% of the annual rainfall is during the months of July, August, and September. Extrapolated data revealed that the area has temperatures ranging approximately from 26ºC to 32.5ºC. The period between February, March and sometimes April are characterized with dust storm and hazy weather.

The equal distribution of wet and dry periods of Gwagwalada confirms the fact that Gwagwalada is a transition point between the Savanna vegetation of the north and forest of Southern Nigeria. The region is characterized by the Guinea vegetation. The vegetation is mainly of the park type which has scattered trees and tall grasses. The forest riparian is found along the valleys of the Iku River and River Usuma. However, this natural vegetation has been greatly distorted by human population and their activities. The areas nearer to the town have smaller girths of trees than areas farther from the town due to high level of fuel-wood consumption.

The population of Gwagwalada has been on increase since the movement of the capital of Nigeria from Lagos to Abuja. As at 1991, the population of the entire area council was 80,841; by 1995 it rose to 94,573 and in the year 2000 it was 115,062. The recent population census conducted in 2006 put the figure for Gwagwalada town at 39,442 which occupies one fourth of the entire Area Council population put at 157,770 (NPC, 2007).

It performs virtually all functions typical of human activities in a town. It has served as an administrative headquarters of Gwagwalada Area Council since creation of the local council. Some of the human activities are education, commerce, agriculture, industry, residential, religious amongst others. Transportation is becoming much denser in Gwagwalada town. Recent studies have shown that commercial motorcycle and vehicular traffic are growing astronomically (Magaji and Shat, 2016).

Sources of Data

The sources of data used for this study comprises of both Primary and Secondary sources of data. The Primary sources include the personal observation during reconnaissance and field survey using the designed questionnaire with little interview granted to some sellers and general public. The secondary data source

includes published and unpublished materials, journal articles, text books, thesis, paper presentation, internet, lecture notes, and government reports, gazettes etc.

Sample and Sampling Procedure

The population of the study comprises of the dealers and the consumers of fuel wood in the study area. The study area was stratified into eight settlements (units), namely: Dagiri, Agwan Dodo, Kutunku, Gwagwalada town, Passo, Paiko-Konkore, Giri, and Gwako. The sample population was determined by adopting the Krejcie and Morgan, (1970) formula for determining for sample size of a giving population, that is:

$$S = \frac{X^2NP\,(1-P)}{d^2\,(N-1) + X^2P\,(1-P)}$$

Where:

S = Required Sample size

X = Z value (e.g. 1.96 for 95% confidence level)

N = Population Size

P = Population proportion (expressed as decimal) (assumed to be 0.5 i.e. 50%)

D = Degree of accuracy (5%), expressed as a proportion (.05); It is margin of error

In each of these units a list of all the fuel wood/charcoal dealers and households that patronise them was compiled making a total of 3450 and the corresponding sample size of 341 was determined. The required number of sampled respondents was systematically selected (Table 1).

Table 1: Sample frame

Communities	Population of household	Sampled size	Sampled sellers
Dagiri	528	47	5
Agwan Dodo	349	31	3
Kutunku	688	61	7
Gwagwalada town	596	53	6
Paso	357	32	3
Paiko-Konkore	374	33	4
Giri	368	33	4
Gwako	190	17	2
Total	**3450**	**307**	**34**

On the other hand, charcoal producers and marketers were also selected using same procedures. In all, a total of three hundred and forty one copies of the questionnaires were administered, and collected immediately. The data collected was analysed with the aid of Statistical Package for Social Science (SPSS, version 21). The results were presented in tables, and charts. Some descriptive analyses were also carried out, such as mean, standard deviation, and Coefficient of Variation, in order to analyse the level of their responses.

Results and Discussion

Socio-economic Characteristics of Respondents

The socio-economic characteristics of respondents include sex, age, marital status, household size and level of education was analysed and presented accordantly.

Table 2: Demographic Characteristic of the Respondents

Sex	**Frequency**	**Percentage**
Male	125	36.7
Female	216	63.3
Total	341	100
Age		
(18-28) *years*	226	66.5
(29-39) *years*	92	27.1
(40-49) *years*	17	5.0
50*years*andabove	5	1.5
Total	340	100
Marital Status		
Single	67	19.6
Married	263	77.1
Divorce	9	2.6
Separated	2	0.6
Total	341	100
Household Size		
Less than 5 persons	128	37.5
5-9 persons	158	46.3
10 persons and above	46	13.5
Total	341	100
Level of Education		
None	18	5.3
Quran School	15	4.4
Primary School	191	56.0
Post Primary School	95	27.9
Tertiary Education	22	6.5
Total	341	100
Habitation status		
Indigene	175	51.3
Migrant	166	48.7
Total	341	100

Source: Field Work, 2016

Table 1 show that females engage more in the fuel wood business than the males. The female respondents were63.3% out of 216 respondents while the male represents are 36.7%. This implies that the major actors in this business are females.

The age distribution of the respondents was also analysed, and the results shows that the bulk of the respondents fall within the age bracket of (18-28)years, which is 66.5% representing 226 respondents, followed by (29-39)years representing 27.1% respondents, (40-49)years, 50years and above represents 5% and 1.5%respectively. Generally, the results show that the youths dominate in the fuel wood and charcoal business.

Marital status of the respondent shows that there are more married respondents than the singles. The married are 77.1% representing 263 respondents, while the singles are 19.6% representing 67persons. Respondents who are divorce or separated represents 2.6% and 0.6% respectively. Most of the respondents have a mean household size of nine. The distribution show that 46.3% respondents representing 158. This was closely

followed by 37.5% respondents with a household size of less than 5 persons, 13.5% of the respondents has a household size of 10 persons and above.

The results also revealed that 56% representing 191 of the respondents have primary education. This is followed by 27.9% representing 95 respondents have secondary School certification, 6.5%, of the respondents had tertiary education and 4.4% has Quran education. 5.3% representing 18 respondents do not have any formal education. The respondents were asked if they are indigenes or migrants, and their responses were presented as follows, 51.3% are indigenes while 48.7% are migrants.

Table 3: Distribution of Respondents according to their Occupation and income status.

Occupational Status		
Variables	**Frequency**	**Percentage**
Farming	59	17.3
Business	199	58.4
Fuel wood/Charcoal Harvesting	25	7.3
Civil servants	37	10.8
Total	**341**	**100**
Monthly Income		
Below N18,000	126	37.0
N18,000-N25,000	62	18.2
N26,000-N35,000	45	13.2
N36,000-N50,000	37	10.9
N51,000 and Above	71	20.8
Total	**341**	**100**

Source: Field Work, 2016

Table3 presents the distribution of the respondents according to their occupational status. Results show that 69.2% representing 236 respondents are businesses persons, 17.3% representing 59 respondents are farming, fuel wood/charcoal production. This followed by 7.3% and 7.2%, representing25 and 21 respondents engage in fuel wood harvesting and charcoal production respectively.

Results also show that 37% representing 126 respondents earned a monthly income of less than N18, 000, followed by 20.8% earning N51, 000 and above. Others earned between N18, 000-N25, 000 representing 18.2%, and N26, 000-N35, 000 representing 13.2%. Only 10.9% of them earned between N36, 000-N50, 000.

Source, choice and use of energy

The source of energy of the respondents is presented in Table 4. Results show that 73.6% representing 151people purchased their fuel wood. Only 26.4%, representing 90 respondents that get theirs directly from the bush. These responses have a mean of 1.74, with a standard deviation of 0.82 and coefficient of variation (COV) of 41.1%. This implies that their responses show a low degree of consistency in their responses, meaning they have diverse sources of energy.

Table 4: Distribution of Respondents on the basis of Source, Choice and use of Energy

Sources of fuel wood/charcoal					
	Freq.	**(%)**	**Mean**	**Std. Dev.**	**COV**
Directly from the bush	90	26.4	1.74	0.82	41.13
Purchase	251	73.6			
Total	341	100			
Choice of Energy					
Fuel wood/Charcoal	110	32.3	2.76	1.15	41.67
Kerosene	102	29.8			
Gas	79	23.2			
Electricity	50	14.7			
Total	341	100			
Used of fuel wood/charcoal					
Used fuel wood/charcoal	192	56.3	1.57	0.51	32.48
Don't used them	148	43.4			
Frequency of the use of wood/charcoal					
Regularly	287	84.2	1.84	0.36	25.71
Occasionally	54	15.8			
Total	341	100			

Source: Field Work, 2016

The choices of energy and usage of fuel wood/charcoal by the respondents was also elicited. Results revealed that those who use gas are 23.2% representing 79 respondents, while those for Electricity are14.7% representing 50 respondents. Respondents who make use of fuel wood/charcoal constituted 32.3% representing 110 respondents. 29.8%, representing 102 respondents, make use of kerosene. Results also indicate that the mean of the responses is 2.78, with a standard deviation of 1.15 and coefficient of variation of 41.67%, implying that there is no consistency in their responses.

Furthermore enquiry was made to find out the proportion of the people using fuel wood/charcoal and the results show that respondents that use charcoals are 56.6%. respondents, while those that do not use it at all is43.4% The responses have a mean of 12.6, with a standard deviation of 0.51 and coefficient of variation of 32.48%, meaning that their responses in this case are fairly distributed.

Results of the analysis revealed that 84.2% representing 287 of the respondents used fuel wood/charcoal regularly. Only 15.8%,of the respondents use it occasionally. It is also revealed that the mean of the responses is 1.84, with a standard deviation of 0.36 and coefficient of variation 25.71%,implying that their responses are fairly distributed.

Impacts of Fuel Wood/Charcoal Consumption

Respondents' views on the possible outcome of fuel wood/charcoal consumption in Gwagwalada Area Council are presented in this section. Questions ranging from availability of trees to the various environmental degradation problems arising from their consumption as fuel wood/charcoal form the subsections. Items in the questionnaire relating to environmental impacts were put together and presented in this section.

Table 5:Availability and reduction of trees in the environment

Availability of trees in the environment					
	Freq.	%	Mean	Std. Dev.	COV
Availability	211	60.4	1.45	0.60	41.38
Not Availability	130	39.6			
Has the consumption of fuel wood lead to the reduction of trees in environment?					
Yes	193	56.6	1.66	0.82	49.4
No	148	43.4			

Source: Field Work, 2016

Table 5 presents the response on the presence of trees in the environment. About 60.4% representing 211 of the respondents attested that there were trees in their environment. Only 39.6% representing 130 respondents said that trees are no longer available. The mean score of their responses is 1.45 with a standard deviation of 0.6 and coefficient of Variation 41.4%, implying that their responses are not consistent, meaning they have extreme views. The response on the reduction of number of trees in the environment revealed that 56.6% representing 193respondents attest that there is reduction in the number of trees. Only 43.4% disagreed with that, with a mean response of 1.66, standard deviation of 0.82 and coefficient of variation of 49.4% implying a high degree of inconsistency on their responses. The trees have depleted in such a way that they collect even the smallest branches, as shown in the plates below.

Plates A, B and C: Different sizes of fuel wood collected.

Table 6: Environmental Hazards Arising from fuel wood and charcoal uses

Environmental Hazards	**Freq.**	**(%)**	**Mean**	**Std. Dev.**	**COV**
Increase temperature	103	41.7	1.86	0.94	50.5
Skin burn	101	40.9			
Fire outbreak	18	7.3			
All of the above	25	10.1			

Source: Field Work, 2016

Table 6 presents information on the environmental hazards arising from fuel wood/charcoal consumption. It can be seen that increase temperature and skin burn are the common environmental hazards suffer in the study area by 41.7% and 40.9% of the respondents respectively. Fire outbreak only affected 7.3%. However, there was information by 10.1% that all the hazards were presents in the study area. The mean response is 1.86, standard deviation 0.94 and coefficient of variation of 50.54% implying a very high degree of inconsistency on their responses.

Environmental Awareness of Tree Depletion

In this section respondents awareness on the impacts of deforestation on the environment is presented. Questions ranging from impacts of deforestation on floods, drought, desertification, and global warming are all presented.

Table 7: Awareness of Environmental Hazards of fuel wood/charcoal consumption

Awareness level	Freq.	Per cent	Mean	STD	COV
Aware that deforestation causes floods	61.9	1.38	0.49	35.51	72.5
Aware that deforestation causes droughts	129	52.2	1.48	0.50	33.8
Aware that deforestation causes erosion	141	57.1	1.43	0.50	35.0
Aware that deforestation causes global warming?	115	46.6	1.53	0.50	32.7
aware that deforestation causes biodiversity lost	120	48.8	1.51	0.50	32.7
Sectional mean			1.3	7.5	41.3

Source: Field Work, 2016

Table 7 shows that most of the respondents are aware of the relationship between deforestation and floods as 61.9% representing 153 respondents indicated that it does. Only 38.1% representing 94 respondents said it doesn't. The responses also revealed that the response mean is1.38 with a standard deviation of 0.49 and covariance of 35.5%, implying fair degree of low responses.

Results also show that most of the respondents are aware of the relationship between deforestation and drought as 52.2% representing 129 respondents indicated that it does. Only 47.8% representing 94 respondents said it doesn't. It is also revealed from the table that the mean of the responses was1.48 with a standard deviation of 0.5 and covariance of 33.78%. This results Implies a fair degree of low responses.

It can be deduced from the table that most of the respondents are aware of the relationship between deforestation and erosion as 57.1% representing 141 respondents are aware of the influence of deforestation on erosion. Only 42.8% representing 106 respondents are not aware. The mean response is 1.43 with a standard deviation of 0.5 and coefficient of variation of 34.97%, this also implies a fair degree of low responses.

They are also aware that deforestation causes biodiversity lost as 48.6% representing 120respondents say it does, while 51.4% of the respondents said it doesn't. It also revealed that the mean of the sample respondents generally was1.51 with a standard deviation of 0.5 and covariance of 45.45%. Results show that some of the respondents are aware of the connection between deforestation and biodiversity lost as 46.6% representing 115 say it does and 53.4% said it is not the cause.

Economic Impacts of Fuel Wood Consumption

In this section the economic impacts of fuel wood/charcoal production and consumption are presented. Questions on the accessibility of the fuel wood/charcoal; the amount spent on acquiring charcoal on the part of the users and how much money realised on the part of the marketers and the uses the money is been put to were all considered and presented here.

Table 8: Accessibility of fuel wood

Is the wood/charcoal accessible?	**Freq.**	**(%)**	**Mean**	**STD**	**COV**
Easily accessible	197	57.8	1.58	0.88	55.70
Difficult to access	116	34.0			
Total	313	100			
Amount spent					
N50	114	33.4			
N100	85	24.9			
N150	40	11.7	2.48	1.40	56.45
N200	65	19.1			
N250	37	10.9			
Total	341	100			
Income					
Below N18000	139	40.8	2.13	1.26	59.15
N18000-N25000	105	30.8			
N26000-N35000	35	10.3			
N36000-N50000	37	10.9			
Above N50,000	25	7.3			
Total	341	100			
Use of the proceeds					
Cultural attachment	107	31.4	1.73	0.61	35.26
For settling school fees	122	35.8	1.64	0.48	29.27
For clothing the family	133	39.0	1.61	0.49	30.43
For family feeding	100	40.5	1.60	0.50	31.25
Use for domestic needs	135	54.7	1.45	0.50	34.48
Sectional mean			1.6	0.5	32.1

Source: Field Work, 2016

Most of the respondents (57.8%) claimed they easily access fuel wood/charcoal. Whereas 34% says fuel wood/charcoal is difficult to access. Their responses have a mean of 1.58, with a standard deviation of 0.88 and coefficient of variation55.7%. The results show that their response is very inconsistent.

Most of the respondents (33.4%) uses fuel wood/charcoal worth N50 for their daily use, 24.9% representing respondents used fuel wood/charcoal worth N100. Results also revealed that the mean of the sample respondents generally was 2.48 with a standard deviation of 1.4 and coefficient of variation 56.45%.

It revealed that 40.8% make monthly monetary gains of below N18000 in the sales of charcoal. This is followed by 30.8% representing 105 respondents who claim of making a monthly income of N18000-N25000 in the sales of wood/charcoal.

They explored the forest resources for different reasons, among which are; the quantity of the fuel wood has a cultural attachment, they used it as part of the bride assess when she is going out for marriage as 31.4% representing 107 of the respondents attested to that.35.2% representing 122respondents used their proceeds for the payment of their children school fees, feeding, for domestics needs, among others.

Health Impacts of Fuel Wood/Charcoal Consumption

In this section the health impacts of fuel wood/charcoal production and consumption are presented. Questions on the health problems arising from fuel wood/charcoal consumption like eye problems, cough, asthma, and lung cancer from respondents are analysed here.

Table 9: Health problems associated with the use of fuel wood/charcoal

Problems experienced	**Freq.**	**(%)**	**Mean**	**STD**	**COV**
Eye problems	115	48.2	1.53	0.52	33.99
Cough	119	46.6	1.51	0.50	33.11
Asthma	49	19.8	1.82	0.44	24.18
Lungs related problems	64	25.9	1.77	0.49	27.68
Have experience skin burn	101	40.9	1.60	0.52	32.50
Have experience fire outbreaks	90	36.4	1.64	0.49	29.88
Sectional mean			1.65	0.50	30.2

Source: Field Work, 2016

Results revealed that some respondents (48.2%) have experienced eyes problems from their usage of fuel wood/charcoal. Respondents who said they never experienced any form of eye problems were more (51.8%). Some respondents (46.6%) have experienced cough from their usage of fuel wood/charcoal. 53.4% respondents said they never experienced any form of cough. Some of them said they experienced asthma while some skin burn diseases. The respondents who experience fire outbreak as results of fuel wood/charcoal consumption are36.4%.

Discussion of results

The analysis shows that females engage more in this business than the males. A follow up investigation shows that the males usually engaged in felling the trees, burning some into charcoal and transporting. This business is carried out by the working age people between the ages of 30-45years. Even though the work is done by everybody but majority are married people who engage into it due to the family demand of means of lively hood. Most of the respondents have a mean household size of nine, this also show how large the families are. The larger the family, the more will be their needs. Their educational level also shows that majority of the respondents (56%) have only primary school certificate. This implies that their literacy level is very low; this might accounted for the high level of their poverty, and the only way out is to exploit the free vegetal resource.

Because of their low level of education, they find it difficult to fit into any civil service job. Results show that 58.4% of the respondents are businesses persons, 17.3% are farmers, 7.3% fuel wood/charcoal production, while 10.8% are civil servants, and their monthly income revealed that 37% earned less than N18, 000, 20.8% earned N51, 000 and above. Others earned between N18, 000-N25, 000 representing 18.2%, and N26, 000-N35, 000 representing 13.2%. Only 10.9% of them earned between N36, 000-N50, 000. A follow up revealed that this income the earned is not regular at times they never realise up to that amount. Compare their family size and income and the present economic recession of Nigeria, this income cannot support their lives completely.
The source of energy of the respondents revealed that 73.6% of the respondents purchased their fuel wood and 26.4% get theirs directly from the bush.

The choices of energy and usage for fuel wood and charcoal by the respondents depends on the cost and availability, results shows that 32.3% used fuel wood, while those for Electricity are 14.7%, and kerosene is 29.8%. 84.2% use the fuel wood/charcoal either regularly or occasionally. This result implies that majority of the people irrespective of their location used fuel wood, either because of its availability or cheapness. This was supported by Adedayo, (2005) who observed that, the over-dependence on fuel wood for energy is chiefly because of its relatively low prices and easy accessibility, he further said that it is due to the constraints in the supply of the conventional fuels and the growing population with a larger segment still falling below incomes

that cannot afford the cost of conventional fuels. But the major problem identified was that, the fuel wood is far fetch and is even becoming too costly for the consumers. This also confirms the work of Chukwu (2001), who observed that over 70 percent of the total population of Nigeria, relies on fuel wood or charcoal as their major source of energy for cooking and heating purposes. This observation was buttressed by another recent data published by The Solar Cooking Archive (2011) which put the estimate of Nigeria's fuel wood consumption as percentage of energy at about 87 percent.

Respondents' views on the outcome of fuel wood/charcoal consumption in Gwagwalada Area Council shows that about 60.4% of the respondents attested that there are still some trees in their environment and 39.6% said that they are no longer available. Most of them really noticed the extinction nature of vegetation. If that is their perception, then this should be the right moment to introduce some sustainable measures of managing the vegetation resources.

Most of the respondents are aware of the relationship between deforestation and drought, erosion, and loss of biodiversity. They also acknowledged the economic benefits of fuel wood and charcoal business. This is true when they spelt out their economic and cultural reasons of the practices. In the course of using the fuel wood they also experience some health related issues such as eye problems, cough, asthma, and lung cancer from respondents are analysed here. This results show that there is need for finding a more environmentally and healthy way of consuming the products.

Conclusion and recommendations

Use of biomass, especially wood, for energy generation in this country is an issue that may not be easily wished away in the nearest future, probably owing to the vagaries associated with demographic and socioeconomic conditions, coupled with the level of technological advancement, and the economy recession in the country. Fuel wood and charcoal production is increasingly becoming the main source of energy in developing countries and Gwagwalada in particular. While advanced nations are perfecting the use of alternative source of energy like the use of solar power, wind, geothermal, etc. which are more efficient and environmentally friendly, developing countries especially Africa are still struggling with the use of fuel wood and charcoal in meeting their energy needs.

With increasing population of Nigeria, and failure of government in meeting the energy requirement of its citizenry, many people in urban areas have resorted back to the use of fuel wood and charcoal. Fuel wood and charcoal are produced from trees, and the over dependence on trees would lead to its depletion and consequent environmental problems. However, in the study area, it was observed that the production of fuel wood and charcoal had some economic benefits like creation of jobs and wealth on the parts of the producers and marketers, at the same time has negative effects on the health of the users and the environment in general. Since the rural people make their livelihood on it, stopping the exploitation and usage without actually providing alternative source of living will create another problem.

It is therefore based on the foregone findings that the following recommendations were made; since a cheaper alternative is yet to be found for the use of wood as fuel wood, it is important that strategies which can enhance sustainable means of producing wood for energy generation be look into. The government should promote the business in a sustainable manner as a way of poverty alleviation through Fuel wood farming culture, where farmers are encouraged to cultivate economic and wood tree, which can be harvested use and sale.

Government should make concerted effort at developing alternative sources of energy like solar, water, wind and geothermal which will not only save our environment in the long run but will create alternative jobs for the fuel wood and charcoals producers and marketers on the short run. The governments and other development agencies are encouraged to make use of this information to support availability of alternative energy sources to supplement fuel wood. In this regard, converting wood wastages (wood shavings and sawdust) to briquettes

and adopt the use of improve wood stove will go along way in reducing the rate of fuel wood consumption and improve the health condition of the consumers and the environment in general.

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